

# Hybrid Element Method for Composite Structures Subjected to Boundary Layer Loading, Phase I

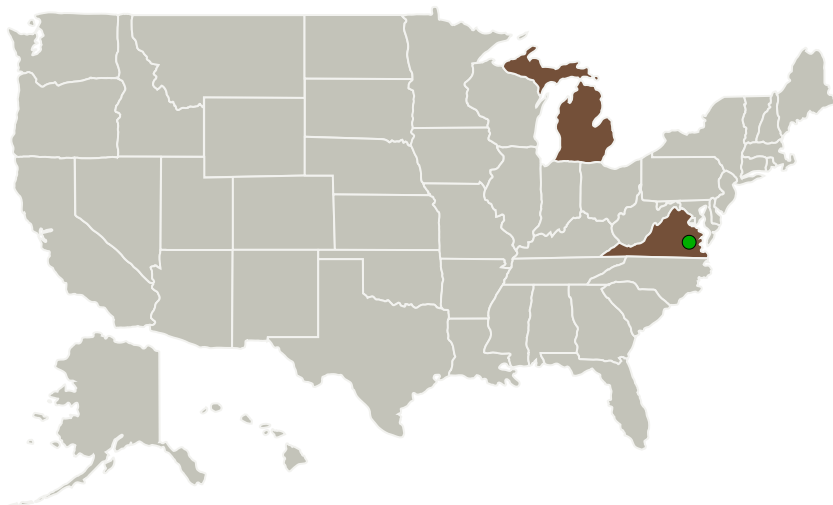
Completed Technology Project (2011 - 2011)



## Project Introduction

In many situations, aerospace structures are subjected to a wide frequency spectrum of mechanical and/or acoustic excitations and therefore, there is a need for the development of numerical modeling techniques that are applicable for the resolution of dynamic response of complex systems spanning the entire frequency spectrum. Further, the modeling of composite structures becomes more and more important since many new vehicle designs incorporate increased amount of composite structural components due to weight specific advantages of composites. Thus, we propose to develop techniques that will allow the prediction of noise in the interior of an enclosure such as aircraft due to the transmission of turbulent boundary layer loading in the presence of composite structural components. This innovative Hybrid Element Method (HEM) solution tool for mid-frequency analysis, which utilizes elements of DEA, together with conventional low frequency FEM tools and high frequency EFEM tools, will provide a unified framework that is applicable for the solution of full frequency spectrum vibroacoustic prediction of nonuniform aerospace structures including metallic/composite configurations, accurately and efficiently.

## Primary U.S. Work Locations and Key Partners



Hybrid Element Method for Composite Structures Subjected to Boundary Layer Loading, Phase I

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

## Hybrid Element Method for Composite Structures Subjected to Boundary Layer Loading, Phase I

Completed Technology Project (2011 - 2011)



Organizations Performing Work	Role	Type	Location
Comet Technology Corporation	Lead Organization	Industry	Ann Arbor, Michigan
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Michigan	Virginia

## Project Transitions

**February 2011:** Project Start

**September 2011:** Closed out

**Closeout Summary:** Hybrid Element Method for Composite Structures Subjected to Boundary Layer Loading, Phase I Project Image

**Closeout Documentation:**

- Final Summary Chart Image(<https://techport.nasa.gov/file/138608>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Comet Technology Corporation

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

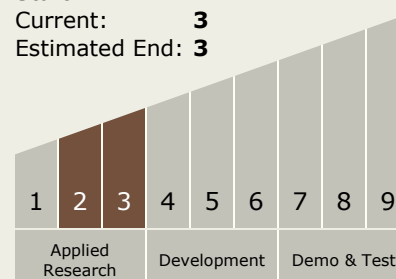
Carlos Torrez

**Principal Investigator:**

S. Raveendra

## Technology Maturity (TRL)

Start: 2  
Current: 3  
Estimated End: 3



# Hybrid Element Method for Composite Structures Subjected to Boundary Layer Loading, Phase I

Completed Technology Project (2011 - 2011)



## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.5 Structural Dynamics
    - └ TX12.5.2 Vibroacoustics

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System